THE DESCRIPTION OF NEW TAXA ON ENZYME DATA: A MATTER FOR DISCUSSION. Z.N.(S.)2458

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The widespread use of isoenzyme techniques, electrophoresis and isoelectric focusing, in studies of molecular biology has had an impact on studies in taxonomy and phylogeny of species in different animal groups. As early as 1963, Manwell & Baker discovered two sibling species of the sea cucumber *Thyonella gemmata* using starch gel electrophoresis. In their study they were able to relate the isoenzyme pattern to some differences in morphology. The first formal description of new taxa on the basis of isoenzyme pattern (Ayala, 1973) were two subspecies of the *Drosophila willistoni* group. Since then, several studies using the isoenzyme technique have revealed the presence of sibling species within what was considered one morphological species; generally, these discoveries were made on sympatric material. Grassle & Grassle, 1976, found the polychaete *Capitella capitella* to be composed of six sibling species, the oligochaete *Lumbricillus rivalis* was shown to be composed of three sibling species (Christensen & Jelnes, 1976), the prosobranch *Goniobasis floridensis* consists of two species (Chambers, 1978). It is beyond the scope of this contribution to mention all such cases, but it is due time, through a debate, to obtain some agreement on procedures for describing taxa, if necessary, solely from enzymic evidence. In literature one can find examples where diagnostic enzymes can not readily be examined by other workers due to inadequate description of the methodology used. It would be fruitful if the suggestions resulting from the discussion opened by this paper could be included in the International Code for zoological nomenclature.

2. What is to be discussed applies *only* to the formal description of new taxa, although the recommendations might have an impact on other isozymic work.

3. The first four recommendations suggested apply to the reproducibility of diagnostic enzyme characters. This is of great importance, as a zoological taxon should be described from diagnostic characters that are readily recognisable for colleagues. It does not suffice to state that 18 specified enzymes were investigated using 11 different buffers. It might well be that an enzyme is diagnostic in one buffer but not in another, e.g. the enzyme glutamate–oxaloacetate transaminase has clearly different mobilities in the species *Bulinus tropicus* and *B. permembranaceus* using buffer C (Jelnes, 1979), whereas the enzyme mobilities are identical using buffer B (Henriksen & Jelnes, 1980) (unpublished observations).

4. I therefore suggest the four following recommendations:

(1) gel medium (starch, polyacryl amide, cellulose acetate, etc.) and gel concentration (where applicable) should be clearly specified, preferably with the name of the manufacturer;

(2) chemical composition of buffers used, either in grams per litre or molarity, as well as pH of the buffers, should be clearly stated;
(3) it should appear clearly in which gels, characterised by the buffer, the different enzymes are stained, and what the staining mixture is composed of;
(4) the procedure of scoring should be indicated. Is it (a) relative mobility to a standard marker, (b) relative mobility to the corresponding enzyme of a specified strain, (c) direct comparison between enzyme bands between the different taxa on the gels, or (d) isoelectric point.

The last three recommendations suggested apply to the concept of the holotype. It is fully realised that these might not apply to all groups of animals, but it is of importance for possible later morphological studies that some material be preserved, labelled properly according to the ICZN as holotype and paratypes.

(5) if possible, not whole animals, but parts of no obvious morphological significance, should be used for enzyme studies. The part of one individual that is not used should be preserved and labelled as the holotype, and those of other individuals from the same locality of similar phenotype or genotype, should be kept and labelled as paratypes;
(6) if whole animals have to be used for enzyme studies, care should be taken to select the type locality as a locality where only the new taxon is found, i.e. without closely related species. This has to be shown by analysis of a number of specimens. The holotype and paratypes can then be designated from the remaining individuals of the collection, constituting only the new taxon as revealed enzymewise;
(7) A photograph of the zymograms showing the diagnostic characters should be provided along with the description, preferably showing the band position(s) of the related species as well.

5. There is no doubt that in the future, enzymic characters will come to play a more important role in systematic work. For those unacquainted with the use of enzymic data in systematics, Avise, 1974, has provided an informative account. I shall look forward to a hopefully fruitful debate on the subject.

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A zoological name published after 1930 is available only if it is 'accompanied by a description or definition that states in words the characters that are purported to differentiate the taxon' (Article 13a(i)). The type affords the standard of reference that determines the application of the name (Article 61). It is evident that the differentiating characters given in the original description of a taxon must be visible in the type of this taxon. This is generally the case in taxa described and differentiated from purely morphological data. If a scientist suspects errors in the description of a taxon he may study his type and propose his own interpretation of the morphological data.

2. Nowadays, however, more and more non-morphological characters are used to differentiate new taxa. Recently the nematode species *Radopholus citrophilus* was established by Huettel, Dickson & Caplan, 1984 (*Proc. helminthol. Soc. Washington*, vol. 51, pp. 32–35) and differentiated by its chromosome number and by seven diagnostic loci in starch gel electrophoresis. These characters are not visible in the traditional glycerine mounts that constitute the type and the type series of the new species.

3. I ask the Commission to study this problem and to provide means for checking the accuracy of the description of a new taxon based on such non-morphological criteria. The type series might be allowed to include photographs or permanent mounts showing chromosomes or protein migration; or a living culture of the type population might be maintained, from which fresh specimens could be taken and processed to verify chromosomes or proteins. Whatever solution is eventually found, I think it is important to give the new criteria equal status with the traditional morphological criteria.